

BRL R 119

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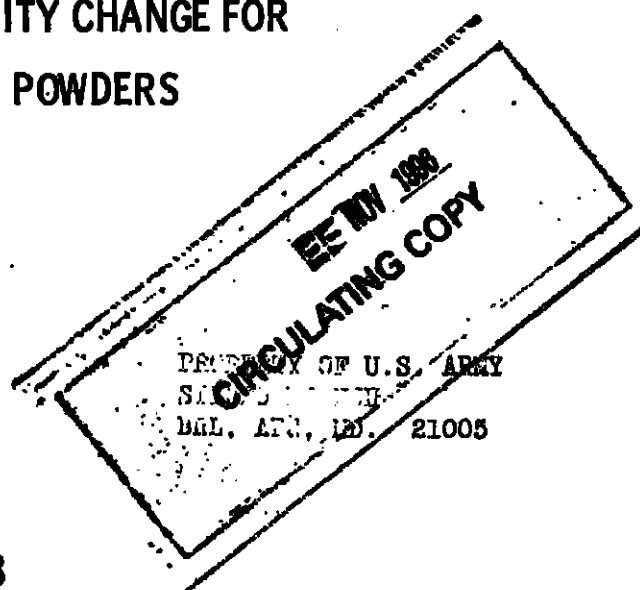
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REPORT NO. 119

WEIGHT OF PROJECTILE-VELOCITY CHANGE FOR 75 MM GUN FIRING FNH POWDERS

by
R. H. Kent

September 1938



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U.S. ARMY ABERDEEN RESEARCH AND DEVELOPMENT CENTER
BALLISTIC RESEARCH LABORATORY
ABERDEEN PROVING GROUND, MARYLAND

Ballistic Research
Laboratory Report No. 119

RHK/emh
Aberdeen Proving Ground, Md.
September 30, 1938

WEIGHT OF PROJECTILE-VELOCITY CHANGE FOR 75 MM
GUN FIRING FNH POWDERS

Abstract

Firings were made to determine the weight of projectile-velocity change in the 75 mm gun for normal and reduced charges. Corrections in muzzle velocity for projectile weight are obtained from the results. A comparison is made between the observed and computed changes to determine whether the difference between the two are significant. Proposals are made for further investigations.

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The Ordnance Office pointed out that in the acceptance tests for complete rounds for the 75 mm Gun Model 1897, it was found that where velocity corrections had to be made for heavier than normal projectile the corrected velocities were lower than when no corrections were necessary. This lead to doubt of the correctness of the formula used for computing such corrections. Since the weight of projectile-velocity change is of great importance not only in powder tests, but also in firing tables, the Ordnance Office recommended that a program be carried out to determine these corrections for the 75 mm gun. Various projectile weights and types of charge as given in Table I were selected for these firings.

Table I

Projectile: 3" shell 1917 Modified to 75 mm
Weights: 11.24, 12.24, and 13.24 lbs.

Powder Lot	Web Thickness	Charge	Composition & Grain Form	Primer
3578 S	.0158	Normal	Mp FNH	M22 75 grain
3629	.0146	Reduced	SP FNH	" "
3632	.0170	Reduced	SP FNH	" "

The results of the firings are given in the attached firing record #10681 and are summarized in the following table:

Table II

Projectile Wt.	Powder Lot	Wt. of Charge lb. oz.	Mean Velocity	Mean Pressure	No. Rds.
12.24	3578+S	1 6.1	1789	27,100	5
11.24	"	1 6.1	1833	24,900	5
13.24	"	1 6.1	1731	28,500	5
12.24	3629	9.0	1109	11,100	5
11.24	3629	9.0	1146	10,400	5
13.24	3629	9.0	1069	11,400	5
12.24	3632	9.43	1119	10,200	5
11.24	3632	9.43	1145	8,900	5
13.24	3632	9.43	1078	10,300	5

By the data given in Table II an empirical weight of projectile-velocity change is determined. However, the observed velocity differences corresponding to variations in the weight of projectile are subject to experimental error because of the dispersion in velocity. A more reliable result can probably be obtained by a combination of theoretical and experimental results as stated below.

For the multi-perforated powder 3578, calculate q_0 and r_0 , as defined in Bennett's Tables for Interior

Ballistics, for each weight of projectile, p. Plot q_0 and r_0 against p and pass a least square straight line through the points. The results are shown in plot 1. To compute the velocity change due to weight changes within the range of weights given, used the values of q_0 and r_0 given by the points on the representative straight

line corresponding to the projectile weights considered.

For the S.P. powders to which Bennett's Tables are not strictly applicable compute b and e as defined in Röggl's Neue Diagramme für die Innere Ballistik, Theorie und Beispiele* and plot them against p, and then proceed as outlined above for the M.P. powder. Plots 2 and 3 give b and e vs p for the S.P. powders.

By means of the values of q_0 and r_0 and b and e given by the representative straight lines shown on plots 1, 2 and 3, the velocity corrections required to correct the velocity of the 75 mm projectile to the standard weight of 12.24 lb. were computed. These results are shown on plots 4, 5 and 6.

It is interesting to compare these results with those previously employed which, as noted above, seemed to give inconsistent results. This may be done by a comparison of the values of n, defined by the equation

$$\frac{\Delta v}{v} = - n \frac{\Delta p}{p},$$

where

Δv = velocity change

Δp = weight change

v = muzzle velocity

p = weight of projectile.

The values of n corresponding to small variations in weight from 12.24 as obtained from plots 4, 5 and 6 are compared with those heretofore employed at the proving ground in Table IV.

Table IV

Charge Powder		n	
		From Plots	Previously Used
Normal	3578	.36	.31
Reduced	3629	.42	.29
	3632		

* See also Ballistic Laboratory Report No. 48. A.P.G. "Röggl's Equation and its Application to Interior Ballistic Problems" by R. H. Kent.

The considerable discrepancy between the two sets will be noted. An important cause of the discrepancy is that the values of n previously used were based on pyro MP powders. When the powders were changed, through inadvertence new values of n were not computed.

Comparison of Theoretical and Observed Weight Velocity Changes

While the weight-velocities changes given above will no doubt be fairly satisfactory for the given charges and projectiles in the 75 mm gun, it is of interest to learn whether the theoretical results using a constant q_0 and r_0 or a constant b and e differ significantly from the empirical ones. If there is no significant difference, considerable confidence may be placed in theoretical computations with constant q_0 and r_0 or b and e for other guns; if there is a significant difference it will be necessary to determine the weight of projectile velocity change empirically for various guns until sufficient improvement in the theory is obtained to permit the discontinuance of the experimental firings.

A test was made of the significance of the variation of the experimental results of these firings from the theoretical ones by means of Student's t test.* In applying this a comparison was made of the observed velocity difference between the 11.24 and 13.24 lb. weights and the computed ones which were based on the velocities and pressures for the 11.24 lb. weight.

By means of the tables for the Student's distribution the probability, P_F , was computed that, if the theory were correct, a difference, due to chance, between the observed and theoretical values greater in absolute value than that actually obtained, would occur. The value of t used in such a computation depends upon the differences between the theoretical and observed results and the standard deviation of the measurements of velocity. The results of these probability computations are given in Table V.

Table V

Powder	Charge oz	Vel. Change for $\Delta p = +2$ Lb. Observed	Computed	Difference Computed-Obs.	P_F
3578J	22.1	-102	-108	-6	.172
3632	9.43	-67	-77	-10	.058
3629	9	-77	-82	-5	.007

* See Fisher "Statistical Methods for Research Workers", Yule and Kendall "An Introduction to the Theory of Statistics" p. 442.

It is customary to consider a probability, p_F , smaller than .05 as significant. On this definition it follows that for the normal charge of 3578 powder the theoretical results do not differ from the experimental ones significantly while for the other two powders they do differ significantly.

In view of the low values of P_F obtained for powders 3632 and 3629 and of the fact that for all three powders the differences between the computed and observed changes are of the same sign it appears that the theory is definitely inadequate. However, the ratios of the computed and observed velocity changes do not differ greatly from unity as shown in the following table.

Table VI

Ratios of Computed to Observed Velocity Changes

<u>Powder</u>	<u>Ratio %</u>
3578 S	106
3632	115
3629	<u>107</u>

Mean 109

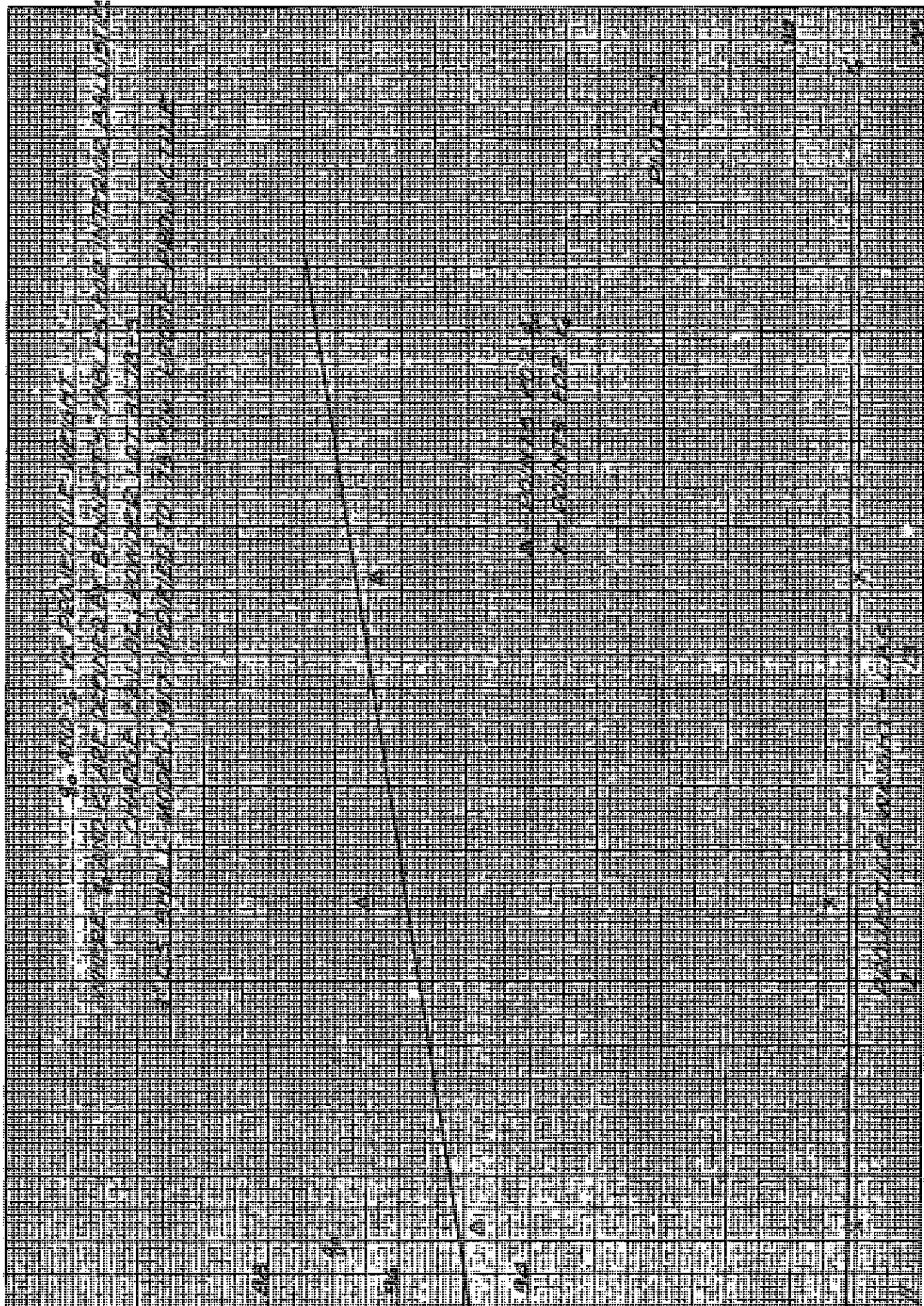
The computed velocity changes with constant q_0 and r_0 or b and e , would be in error by only 9% on the average. Hence unless corrections for large weight changes have to be made, say greater than .5 lb. no serious error results from the use of the computed corrections.

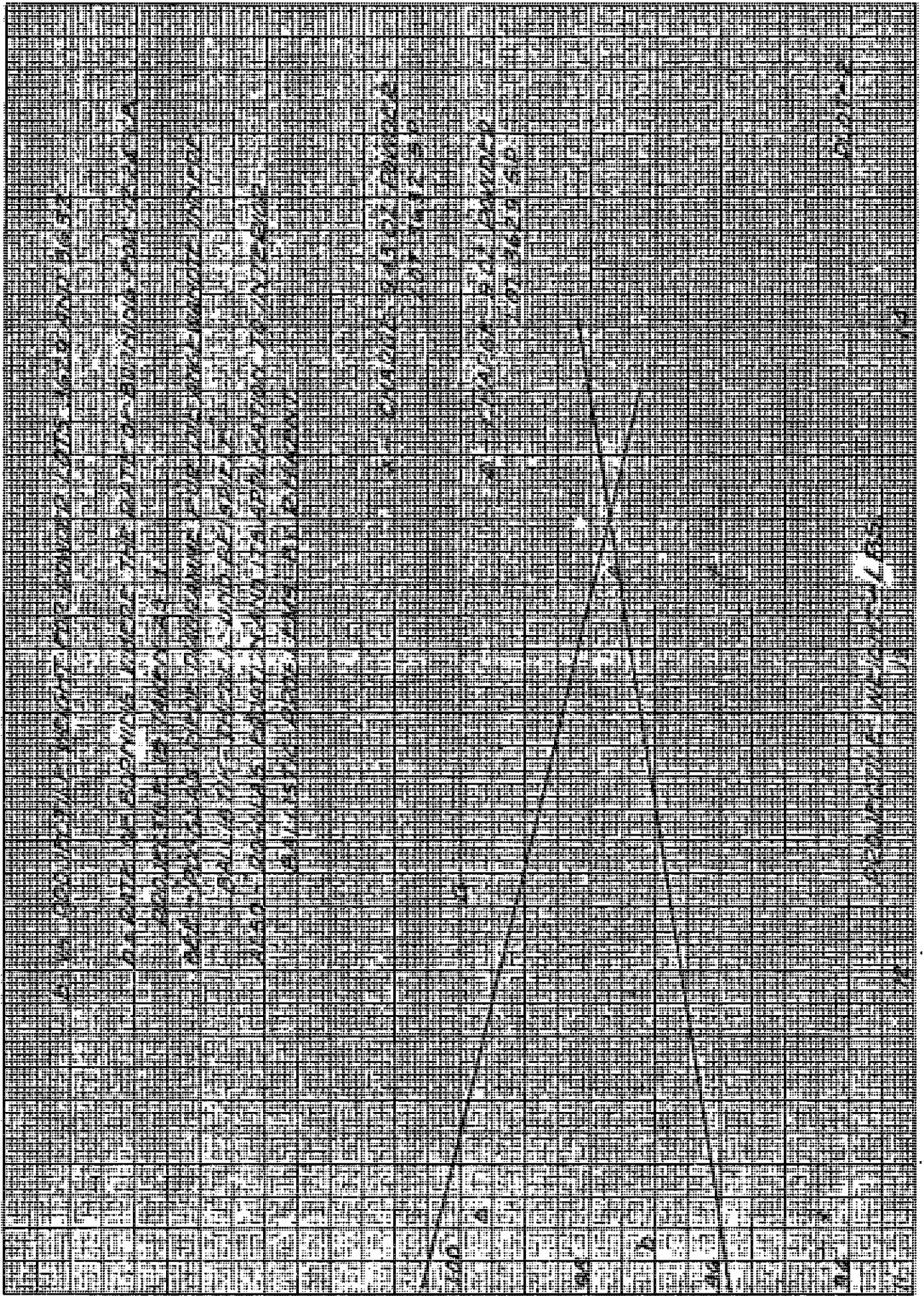
The proving ground proposes to continue work on this subject as follows:

1. Compute corrections for various weapons based on powder currently used to replace the corrections based on pyro powders. (Some of these have already been computed).
2. To make further comparisons of the theoretical and observed results using reports kindly furnished by Mr. Feltman of the Ordnance Office.
3. Depending on the results obtained from (2.) to make recommendations for such further firings in various guns as may seem expedient.

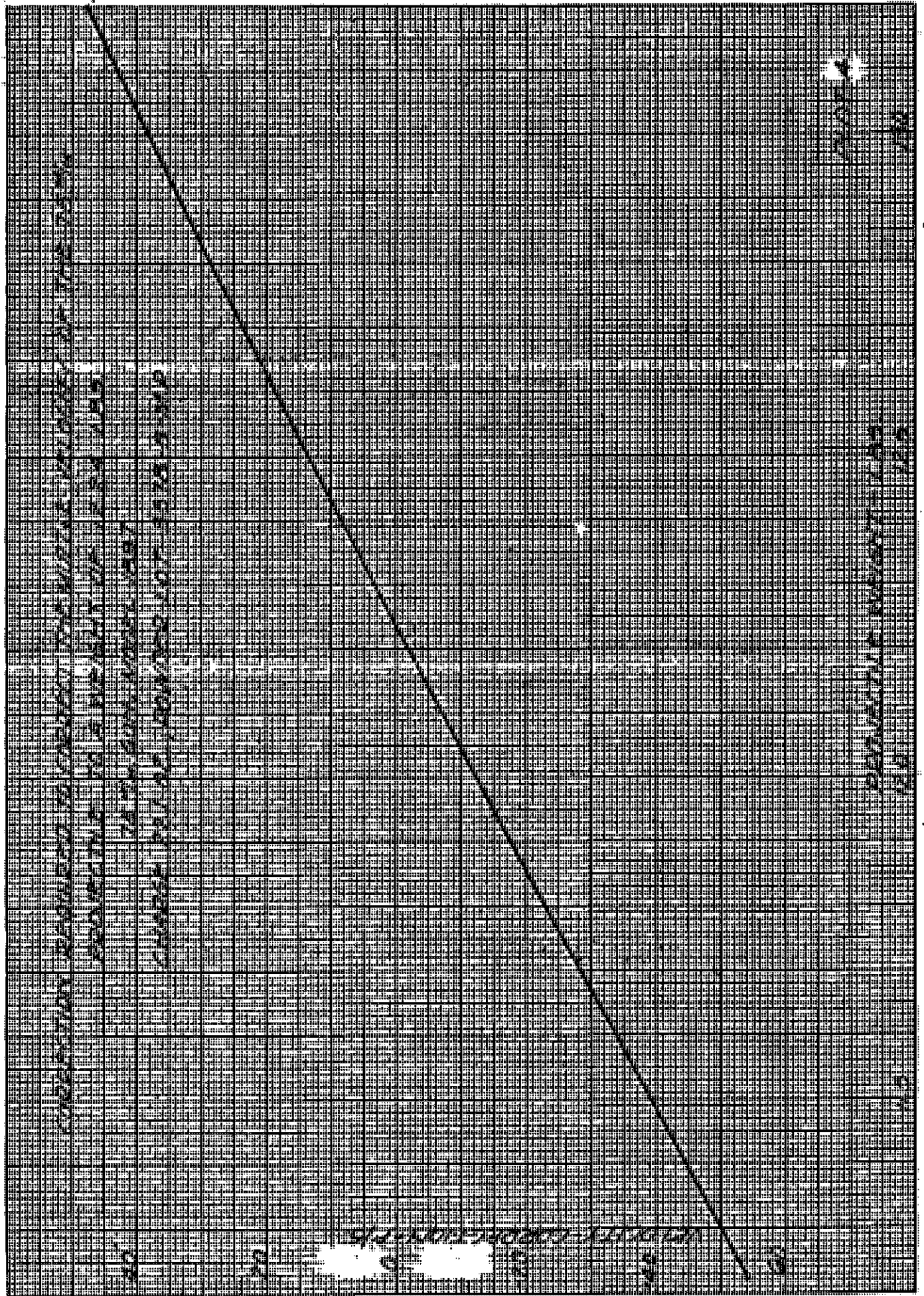
Computations for this report have been done by Mr. J. V. Holberton.

R. H. Kent
R. H. Kent

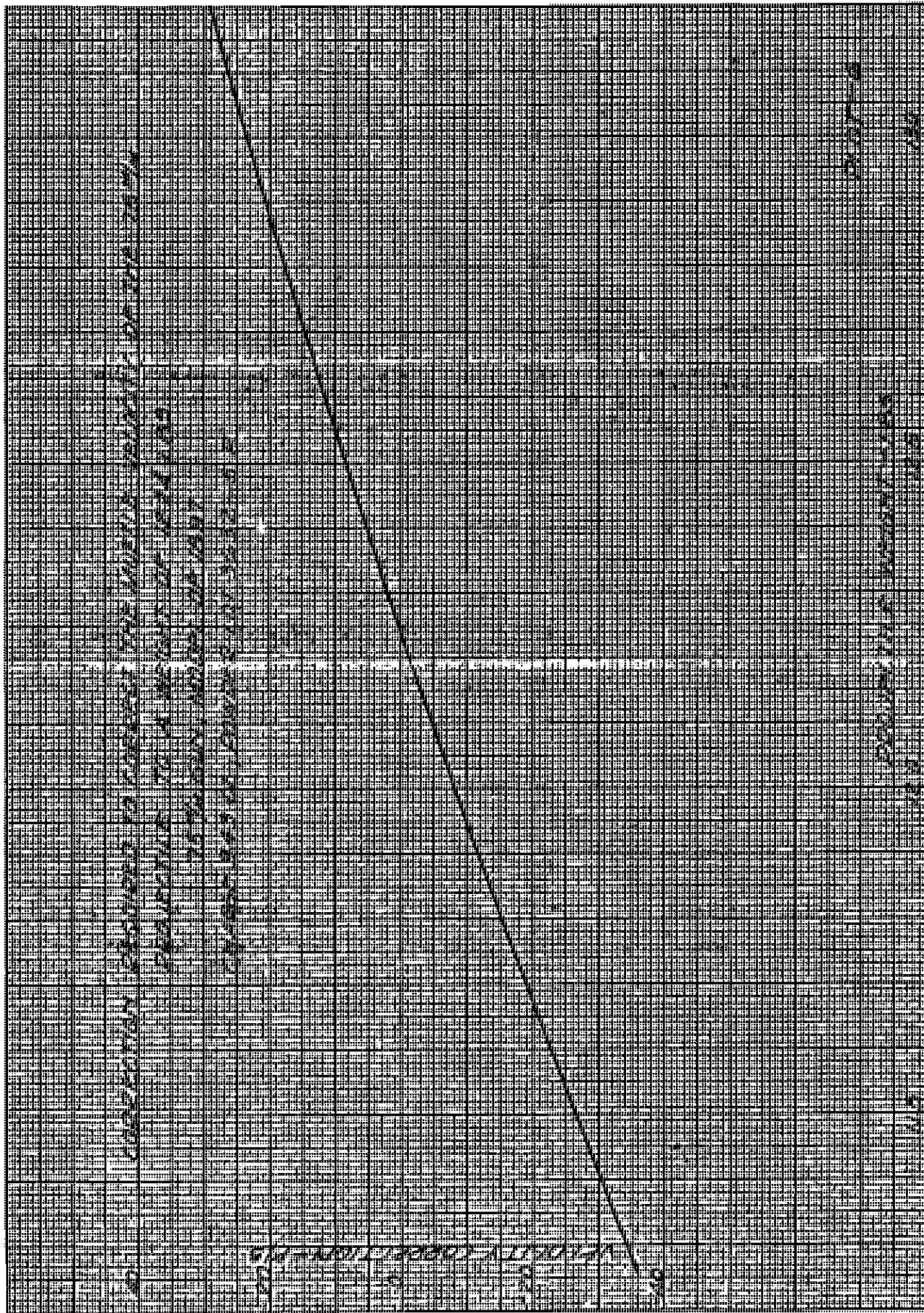








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13C-95a 20

ABERDEEN PROVING GROUND FIRINGS

Object of Firing: Firings to determine the velocity change due to change in weight of projectile

Date of Firing: March 9, 1938
 Firing Record No. 10681
 Sheet 1 of 9
 T. M. T. P.
 O. C. M. Item
 O. P. No.
 Contract No.
 O. O. File 471.52/2223
 A. P. G. File 471.121/224-5
 W. O. No. 303-3-1 11

Related F. R. Nos.

	CALIBER	MODEL	MANUFACTURER	No.	ROUNDS FIRED PRIOR TO TEST
Cannon	75 M/M Gun	1897	Wisconsin Gun Co.	3625	3075
Carriage	75 M/M Gun	1897 M1	Willys Overland Co.	287	
Recoil Mech.	75 M/M Gun	1897 A3	Singer Mfg. Co.	193	

Azimuth of line of fire

Deflection from

AP

Mil

Gun position Main Front - Standardization Range Target

Projectile	(3" C.S. Shell, Model 1917 modified to 75 M/M Proof Projectile) Dwg. 75-2-158 V _c - 82.62 m/s T _a - 89.3 s
Bursting charge	None
Booster	None
Fuze	None
Powder	D.P. FNH M1, P.A. Lot X-3578-1933 for 75 M/M Gun, M1897-1916-1917 D.P. FNH Lot X-3636-1930 for 2.95" Sub.Cal. Gun D.P. FNH Lot 3629-1929 for 2.75" Sub.Cal. Tube D.P. FNH Lot X-3632-1929 for 75 M/M Gun
Case PRIMER	Mk. 1, Dwg. 71-2-71
Igniter	None
Primer	M22 Perc. P.A. Lot 1285-32, Dwg. 74-2-35, Rev. 11-23-33

GENERAL DATA BY ROUNDS

1938 DATE	ROUND NO.	TIME OF FIRING	PROJECTILE			POWDER			ELEVATION Deg-Min.	FINAL CORRECTED		Sol. M.V.
			No.	WEIGHT AS FIRED lbs.		LOT	BOX NO.	CHARGE WEIGHT lbs.-ozs.		PRESSURE	BOUL. VELOCITY	
March												
9	3076	8:51		11.72		X-3578		10	0 12		1062	1064
	3077	8:54		12.21		"		1 6.1	" "	27500	1783	1783
	3078	8:57		"		"		" "	" "	27200	1791	1789
	3079	8:59		"		"		" "	" "	26000	1784	1785
	3080	9:00		"		"		" "	" "	27300	1789	1788
	3081	9:01		"		"		" "	" "	27700	1791	1798
	3082	9:03		11.21		"		" "	" "	25100	1838	1839
	3083	9:05		"		"		" "	" "	23500	1826	1825
	3084	9:06		"		"		" "	" "	25400	1829	1831
	3085	9:08		"		"		" "	" "	25400	1842	1837
	3086	9:09		"		"		" "	" "	24900	1840	1835
	3087	9:11		13.21		"		" "	" "	27400	1723	1721
	3088	9:13		"		"		" "	" "	29100	1737	1734
	3089	9:15		"		"		" "	" "	28100	1727	1729
	3090	9:17		"		"		" "	" "	28300	1735	1735
	3091	9:19		"		"		" "	" "	29400	1735	1736
	3092	9:21		12.21		X-3636		0 7	" "	8400	959	959
	3093	9:23		"		"		" "	" "	9200	966	966
	3094	9:26		"		"		" 8.5	" "	11000	1082	1083
	3095	9:27		"		"		" "	" "	11100	1088	1088
	3096	9:40		"		"		" 8.85	" "	11200	1111	1111
	3097	9:42		"		"		" "	" "	12500	1111	1113
	3098	11:17		11.72		"		" 8.0	" "		1067	1068
	3099	11:18		12.21		X-3629		" "	" "	9200	1076	1076
	3100	11:27		"		"		" 8.50	" "	10700	1078	1079
	3101	11:36		"		"		" 9.0	" "	10900	1111	1111
	3102	11:55		"		"		" "	" "	10900	1109	1108
	3103	11:57		"		"		" "	" "	11500	1110	1110
	3104	12:00		"		"		" "	" "	11500	1112	1111
	3105	12:02		"		"		" "	" "	10900	1104	1103
	3106	12:04		11.21		"		" "	" "	10000	1150	1149
	3107	12:05		"		"		" "	" "	10400	1146	1145
	3108	12:06		"		"		" "	" "	10700	1148	1145
	3109	12:07		"		"		" "	" "	10300	1151	1147
	3110	12:08		"		"		" "	" "	10400	1145	1142

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GENERAL DATA BY ROUNDS.

1938 DATE Mar.	ROUND NO.	TIME OF FIRING	PROJECTILE			POWDER				ELEVATION		FINAL CORRECTED		Sol. M.V.
			No.	WEIGHT AS FIRED lbs.		LOT	BOX No.	CHARGE WEIGHT lbs.-ozs.	Deg.-Min.	Pressure	Boul. VELOCITY			
9	3111	12:09		13.24		X-3629		0 9.0	0 12	11100	1070	1066		
	3112	12:10		"		"		" "	" "	11700	1072	1068		
	3113	12:12		"		"		" "	" "	12000	1074	1071		
	3114	12:14		"		"		" "	" "	11000	1072	1069		
	3115	12:15		"		"		" "	" "	11100	1072	1070		
	3116	1:18		12.24		X-3632		" "	" "	9300	1087	1095		
	3117	1:20		"		"		" "	" "	9600	1093	1091		
	3118	1:29		"		"		" 9.3	" "	9900	1108	1105		
	3119	1:32		"		"		" "	" "	9500	1104	1102		
	3120	1:48		"		"		" 9.48	" "	9700	1120	1119		
	3121	1:51		"		"		" "	" "	10200	1123	1121		
	3122	2:17		"		"		" 9.43	" "	10500	1120	1119		
	3123	2:19		"		"		" "	" "	10300	1120	1118		
	3124	2:20		"		"		" "	" "	10200	1119	1118		
	3125	2:22		"		"		" "	" "	10000	1123	1122		
	3126	2:24		"		"		" "	" "	9900	1118	1117		
	3127	2:26		11.24		"		" "	" "	9300	1147	1145		
	3128	2:28		"		"		" "	" "	8100	1132	1131		
	3129	2:30		"		"		" "	" "	8300	1145	1148		
	3130	2:31		"		"		" "	" "	8900	1142	1142		
	3131	2:33		"		"		" "	" "	9700	1160	1158		
	3132	2:34		13.24		"		" "	" "	10600	1083	1080		
	3133	2:36		"		"		" "	" "	10300	1076	1075		
	3134	2:37		"		"		" "	" "	10300	1081	1080		
	3135	2:39		"		"		" "	" "	10200	1076	1075		
	3136	2:41		"		"		" "	" "	10000	1082	1079		

Rds. 3076 & 3098, warming rounds.

C

VELOCITY DATA

Cannon 75 M/M Gun, M1897, No. 3625 Fired by Lt. J.D. Armitage on March 9, 1938

Screen Distances	GUN TO FIRST	HORIZONTAL	CORRECTED TO	BETWEEN	HORIZONTAL	CORRECTED TO
	Coil.....	69.14 ft.		Coil.....	100.115 ft.	
	Screen.....	60.15 ft.		Screen.....	120.47 ft.	

ROUND NO.	TIME OF FIRING	FORM FACTOR	BOULENOE					SOLENOID *	
			ORONOGRAPH NUMBER			MEAN INSTRUMENTAL	MUZZLE VELOCITY	INSTRUMENTAL	MUZZLE VELOCITY
			1347	1335	1305				
3076	8:51	1 - 1.16	1054	1050	1053	1052	1062	1053	1064
3077	8:54	1 - 1.16	1750	1760	1760	1757	1783	1756	1783
3078	8:57		1761	1765	1768	1765	1791	1762	1789
3079	8:59		**	1759	1756	1758	1784	1758	1785
3080	9:00		1760	1766	1764	1763	1789	1761	1788
3081	9:01		1767	1761	1768	1765	1791	1771	1798
3082	9:03	1 - 1.16	1808	1806	1812	1809	1838	1809	1839
3083	9:05		1796	1794	1800	1797	1826	1795	1825
3084	9:06		1797	1800	1802	1800	1829	1801	1831
3085	9:08		1813	1811	1814	1813	1842	1807	1837
3086	9:09		1808	1813	1813	1811	1840	1805	1835
3087	9:11	1 - 1.16	1697	1701	1701	1700	1723	1696	1721
3088	9:13		1714	1712	1715	1714	1737	1709	1734
3089	9:15		1706	1701	1706	1704	1727	1704	1729
3090	9:17		1712	1713	1712	1712	1735	1710	1735
3091	9:19		1714	1709	1713	1712	1735	1711	1736
3092	9:21	1 - 1.16	952	954	952	953	959	952	959
3093	9:23		960	960	959	960	966	959	966
3094	9:26		1073	1070	1073	1072	1082	1072	1083
3095	9:27		1078	1077	1078	1078	1088	1077	1088
3096	9:40		1101	1097	1101	1100	1111	1099	1111
3097	9:42		1101	1097	1101	1100	1111	1101	1113
3098	11:17		1058	1054	1059	1057	1067	1057	1068
3099	11:18		1066	1066	1066	1066	1076	1065	1076
3100	11:27		1069	1064	1070	1068	1078	1068	1079
3101	11:36		1102	1101	1097	1100	1111	1099	1111
3102	11:55		1099	1097	1097	1098	1109	1096	1108
3103	11:57		1101	1099	1097	1099	1110	1098	1110
3104	12:00		1101	1104	1099	1101	1112	1099	1111
3105	12:02		1094	1094	1091	1093	1104	1091	1103
3106	12:04		1137	1137	1135	1136	1150	1134	1149
3107	12:05		1134	1132	1131	1132	1146	1130	1145
3108	12:06		1135	1136	1132	1134	1148	1130	1145
3109	12:07		1136	1138	1136	1137	1151	1132	1147
3110	12:08		1132	1131	1130	1131	1145	1127	1142

VELOCITY DATA

Cannon 75 M/M Gun, M1897, No. 3625

Fired by Lt. J. D. Armitage on March 9, 1938

Screen Distances	GUN TO FIRST	HORIZONTAL	CORRECTED TO	BETWEEN	HORIZONTAL	CORRECTED TO
	Coil	69.14 ft.		Coil	100.115 ft.	
	Screen	60.15 ft.		Screen	120.47 ft.	

ROUND NO.	TIME OF FIRING	FORM FACTOR	BOULENGE					SOLENOID *	
			CHRONOGRAPH NUMBER			MEAN INSTRUMENTAL	MUZZLE VELOCITY	INSTRUMENTAL	MUZZLE VELOCITY
			1947	1335	1305				
3111	12:09	1 - 1.16	1060	1061	**	1061	1070	1057	1066
3112	12:10		1064	1065	1060	1063	1072	1059	1068
3113	12:12		1066	1065	1065	1065	1074	1062	1071
3114	12:14		1064	1061	1063	1063	1072	1060	1069
3115	12:15		1065	1063	1061	1063	1072	1061	1070
3116	1:18		1078	1075	1075	1076	1087	1073	1085
3117	1:20		1082	1082	1081	1082	1093	1079	1091
3118	1:29		1097	1097	1097	1097	1108	1093	1105
3119	1:32		1094	1091	1094	1093	1104	1090	1102
3120	1:48		1111	1106	1110	1109	1120	1107	1119
3121	1:51		1114	1110	1113	1112	1123	1109	1121
3122	2:17		1112	1107	1107	1109	1120	1107	1119
3123	2:19		1110	1108	1110	1109	1120	1106	1118
3124	2:20		1108	1108	1107	1108	1119	1106	1118
3125	2:22		1112	1112	1111	1112	1123	1110	1122
3126	2:24		1107	1108	1107	1107	1118	1105	1117
3127	2:26		1134	1132	1134	1133	1147	1130	1145
3128	2:28		1119	1119	1119	1119	1132	1117	1131
3129	2:30		1132	1131	1131	1131	1145	1133	1148
3130	2:31		1130	1126	1128	1128	1142	1127	1142
3131	2:33		1144	1147	1146	1146	1160	1143	1158
3132	2:34		1073	1077	1072	1074	1083	1071	1080
3133	2:36		1069	1067	1066	1067	1076	1066	1075
3134	2:37		1073	1072	1072	1072	1081	1071	1080
3135	2:39		1069	1066	1066	1067	1076	1066	1075
3136	2:41		1073	1075	1071	1073	1082	1070	1079

*This correction from Instrumental Velocity to Muzzle Velocity includes a Tuning Fork correction.

**No mark on rod.

PRESSURE DATA

Type of gauge Medium Caliber

Position of gauge In base of cartridge case.

Metal of crusher cylinder Sept. 12, 1918. Annealed April 4, 1919.

Initial compression 0

ROUND NO.	BAND DIAM. INS.	GUAGE NO.	PRESSURE 100	GUAGE NO.	PRESSURE 100	GUAGE NO.	PRESSURE 100	GUAGE NO.	PRESSURE 100	MEAN
3077		4648	273	5787	277					275
3078		4763	275	5439	269					272
3079		2847	273	4110	246					260
3080		4428	278	4266	267					273
3081		5774	289	4463	265					277
3082		4508	254	4612	247					251
3083		3107	236	4516	233					235
3084		4341	251	4971	256					254
3085		4160	259	4287	249					254
3086		4521	256	4156	242					249
3087		4168	274	4121	274					274
3088		4291	294	4292	287					291
3089		5028	283	5714	278					281
3090		4297	288	2717	277					283
3091		5028	298	5925	290					294
3092		4166	82	1943	86					84
3093		1941	92	4136						92
3094		5786	112	5747	108					110
3095		1865	111	4352	111					111
3096		4563	111	2846	112					112
3097		5245	125	3768	124					125
3099		4930	92	4174	92					92
3100		4303	106	4955	108					107
3101		5450	103	4112	115					109
3102		5493	107	4861	110					109
3103		5949	115	4247	115					115
3104		4190	116	4358	114					115
3105		4200	112	4115	105					109
3106		6005	99	5991	101					100
3107		4614	104	1999	104					104
3108		5975	108	5670	105					107
3109		3779	102	4429	104					103
3110		4203	104	3254	104					104

PRESSURE DATA

Type of gauge Medium Caliber

Position of gauge In base of cartridge case

Metal of crusher cylinder Sept. 12, 1918. Annealed April 4, 1919.

Initial compression 0

ROUND NO.	RAND DIAM. IN.	GAUGE NO.	PRESSURE 100	GAUGE NO.	PRESSURE 100	GAUGE NO.	PRESSURE 100	GAUGE NO.	PRESSURE 100	MEAN
3111		5803	109	4655	113					111
3112		4729	119	5753	114					117
3113		5680	120	5795	120					120
3114		4847	110	6016	110					110
3115		2833	111	3245	110					111
3116		4482	92	5722	94					93
3117		4706	98	5720	93					96
3118		1743	99	3277	98					99
3119		5371	100	4356	90					95
3120		6056	95	1350	99					97
3121		5666	99	2930	104					102
3122		5922	106	4863	104					105
3123		2828	100	4856	105					103
3124		4745	99	4748	105					102
3125		4135	102	4878	98					100
3126		4574	98	4329	100					99
3127		3672	94	5822	91					93
3128		4119	82	4320	80					81
3129		5893	84	2981	82					83
3130		4909	85	4541	92					89
3131		2801	96	4102	98					97
3132		4249	105	3237	106					106
3133		5206	104	4654	102					103
3134		5080	105	2155	100					103
3135		5700	103	2982	100					102
3136		4600	100	5725	100					100

Pressures in this report are read and calculated to the nearest one hundred lbs.

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MISCELLANEOUS DATA

No change in gun or carriage since last firing.

There were no hangfires, misfires, flarebacks or evidence of unconsumed powder on any round.

Gun and carriage functioned satisfactorily.

Small red flash and very little gray smoke on Rd. 3076.

Moderate amount of light gray smoke and no flash on all other rounds.

Rd. 3085, ruptured case.

UNIFORMITY DATA

POWDER LOT	CHARGE		PROJ. WT. LBS.	MUZZLE VELOCITY - F.S.				PRESSURE - LBS.			
	LBS.	GRS.		CHRONO-NO.	MAX. VAR.	MEAN	NO.	MAX. VAR.	MEAN	NO.	MAX. VAR.
				GRAPH	RDS.	MEAN	F.S. %	DEV.	RDS.	MEAN	Lbs. %
3578-S	1	6.1	12.24	Sol.	5	1789	15 .84	4.0	5	27100	1700 6.27
				Boul.	5	1788	8 .45	3.2			
3578-S	1	6.1	11.24	Sol.	5	1833	14 .76	4.4	5	24900	1900 7.63
				Boul.	5	1835	16 .87	6.0			
3578-S	1	6.1	13.24	Sol.	5	1731	15 .87	4.8	5	28500	2000 7.02
				Boul.	5	1731	14 .81	5.2			
3629	(	9.0	12.24	Sol.	5	1109	8 .72	2.4	5	11100	600 5.41
				Boul.	5	1109	8 .72	2.2			
3629	)	9.0	11.24	Sol.	5	1146	7 .61	2.0	5	10400	700 6.73
				Boul.	5	1148	6 .52	2.0			
3629	(	9.0	13.24	Sol.	5	1069	5 .47	1.4	5	11400	1000 8.77
				Boul.	5	1072	4 .37	.8			
3632		9.43	12.24	Sol.	5	1119	5 .45	1.4	5	10200	600 5.08
				Boul.	5	1120	5 .45	1.2			
3632		9.43	11.24	Sol.	5	1145	27 2.36	6.6	5	8900	1600 17.98
				Boul.	5	1145	28 2.45	6.6			
3632		9.43	13.24	Sol.	5	1078	5 .46	2.2	5	10300	600 5.83
				Boul.	5	1080	7 .65	2.8			

Rds. 3092 to 3097 incl. were fired with D.P. Lot 3636, which has a web of .0143, to establish charge. This was closest to the web desired (.0140) that was in stock. It was discovered after loading ten rounds for uniformity series that the amount of powder shown on the Stock Record card (32 lbs. approx.) was in error and that actually there were only about 8 lbs. in the box. This was insufficient to complete this phase of the test. The next closest powder in web was D.P. Lot 3629 with a web of .0146 and this powder was used, after conferring with Mr. Kent.

MISCELLANEOUS DATA

METEOROLOGICAL DATA

TIME	BAROMETER	THERMOMETER	HUMIDITY	WIND	
				DIR.	MPH
8 AM	30.29	32	75	NW	2
10 AM	30.30	41	39	NW	7
12 Noon	30.24	45	34	WNW	8
2 PM	30.19	50	25	WNW	13

JOHN D. ARSETAGE,
1st Lt., Ord. Dept.,
Proof Officer.

APPROVED:

C. M. WESSON,
Col., Ord. Dept.,
Commanding.

C. F. HOPSTETTER,
Major, Ord. Dept.,
Chief Proof Officer,
Gun Testing Division.